Big Game Species Richness

Three EnviroAtlas national maps display the number of big game species with potential habitat within each 12-digit hydrologic unit (HUC) in the conterminous United States. These data are based on habitat models rather than wildlife counts. Potential habitat may include significant migration routes to wintering areas.

Why are big game species important?

The term big game refers to large animals that may be hunted for food or sport, including, elk, mule and white-tailed deer, bear, moose, bison, pronghorn, mountain sheep, and feral hog. Individual state fish and wildlife agencies determine a species designation as a game species.

The metric, Big Game Species Richness, estimates the number of big game species that may inhabit an area based on potential habitat. Species richness is one measure of biodiversity that can represent the relative conservation value of a particular area. Many scientists believe that biodiversity, because it represents all forms of life on earth, provides or supports the core benefits that humans derive from their environment to sustain human society, economy, health, and well-being. Managing for biodiversity is one way to balance competing demands for ecosystem services.[1]

Within a food chain, big game animals function as primary and secondary consumers or as a food source for other wildlife. Grazers and browsers, such as elk and deer, directly modify the species composition and condition of grassland and forest habitats. Top predators, by regulating herbivore numbers, indirectly influence habitat condition by reducing grazing pressure on plant production. A predator-prey balance helps to maintain plant and animal species diversity.[2] In the absence of large predatory species, such as wolves and cougars, the harvesting of large game by humans becomes a substitute for natural predator control.

In addition to their roles in ecosystems, big game species serve as an important food source, and they are appreciated for providing aesthetic value and recreation opportunities. The chance to see elk, deer, bison, or bear attracts visitors to parks and other wildlife management areas. Big game hunting has a long tradition in the U.S. In 2011, approximately 85% of hunters pursued big game.[3] Beyond its recreational value, hunting provides an economic vehicle for conservation, management, and restoration projects, the benefits of which extend beyond big game species. The total economic impact

Photo: Elk, S. Theodorski, NPS

of hunting for 2015 was $78 billion. Hunting expenditures were $33 billion for that same time period. The U.S. Fish and Wildlife Service estimated that one-third of what hunters spent in 2011 went towards accommodations, transportation, and other tourism-related activities.[3] Revenue from hunting excise taxes and licenses is used to support land acquisition, conservation, and restoration. In 2013, the U.S. Fish and Wildlife Service appropriated over $522 million for states to use for wildlife conservation and restoration purposes.[4]

How can I use this information?

Three EnviroAtlas maps, Mean, Maximum, and Normalized Index of Biodiversity (NIB), illustrate Big Game Species Richness for the conterminous United States.[5] Used together or independently, these maps can help identify areas of potentially low or high big game species richness to help inform decisions about resource restoration, use, and conservation. Mean richness is a commonly used and understood value for comparison. NIB provides an index to compare a metric with other metrics across multiple project scales simultaneously. Maximum richness identifies habitats that are species rich but may not occupy large areas (e.g. linear riparian areas).

These maps can also be used in conjunction with other maps in EnviroAtlas such as ecoregions, the U.S. Geological Survey (USGS) protected areas database (PAD-US), or the USGS Gap Analysis Project (GAP) ecological systems to help identify areas with high ecological or recreational value for inclusion in conservation, recreation, or restoration planning.

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After learning the Big Game Species Richness values for a particular 12-digit HUC, users can investigate an area more intensively by using individual species models available from the GAP Project.

How were the data for this map created?

The USGS GAP project maps the distribution of natural vegetation communities and potential habitat for individual terrestrial vertebrate species. These models use environmental variables (e.g., land cover, elevation, and distance to water) to predict habitat for each species. GAP modeled habitat for big game species that reside, breed, or use the habitat within the conterminous U.S. for a significant portion of their life history.

The map was derived from 17 GAP-modeled species identified as big game species by state wildlife agencies combined to calculate richness by pixel. The mean and maximum numbers of big game species in each 30-meter pixel were calculated for each 12-digit HUC. The mean species richness value by HUC was divided by the maximum mean value within all HUCs to calculate the NIB.

What are the limitations of these data?

EnviroAtlas uses the best data available, but there are still limitations associated with the data. These data, based on models and large national geospatial databases, are estimations of reality that may overestimate actual big game species presence. Modeled data are intended to complement rather than replace monitoring data. Habitat models do not predict the actual occurrence of species, but rather their potential occurrence based on their known associations with certain habitat types. Habitat is only one factor that determines the actual presence of a species. Other factors include habitat quality, predators, prey, competing species, and fine scale habitat features.

Other essential species information in addition to species richness includes the types of species and their functional groups, whether they are rare or common, native or non-native, tolerant or intolerant of disturbance.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. Individual 30-meter pixel data may be downloaded from the New Mexico State University Center for Applied Spatial Ecology.

Where can I get more information?

A selection of resources related to big game and biodiversity is listed below. Information on the models and data used in the USGS Core Science Analytics, Synthesis & Library's GAP project is available on their website. For additional information on how the data were created, access the metadata for the data layer from the layer list drop down menu. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

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Selected Publications

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5. Kepner, W.G., K.G. Boykin, D.F. Bradford, A.C. Neale, A.K. Leimer, and K.J. Gergely. 2011. Biodiversity metrics fact sheet, EPA/600/F-11/006, U.S. Environmental Protection Agency, Washington, D.C.

Pearce, D., and D. Moran. 1994. *The economic value of biodiversity*. International Union for Conservation of Nature, Taylor and Francis, New York, New York. 104 p.